

REMARKS

The Applicants have received and reviewed the non-final Office Action mailed March 23, 2007. The Applicants originally submitted claims 1-25 in this application. By a previous Response to a Restriction Requirement dated February 26, 2007, the Applicants withdrew claims 7-10 and 20-25. By the present Response and Amendment, the Applicants have amended claims 1 and 11, but have not canceled any claims. Thus, claims 1-25 remain pending in this application.

Claim Rejection Under 35 U.S.C. §103

The Examiner rejected claims 1-2 and 11-12 under 35 U.S.C. §103(a) as being unpatentable over Sudo (U.S. Patent No. 6,839,335) and further in view of Liu et al. (U.S. Patent Publication No. 2001/0007574). The Applicants respectfully traverse the rejection in view of the claim amendments above and the remarks set forth below.

The Applicants' apparatuses and methods are directed to wavelength spread-spectrum coding methods and apparatus for use in wavelength division multiplexing (WDM) communication systems. Wavelength division multiplexing is used in optical communication systems to transmit multiple channels of information, at different wavelengths, over a single optical transmission medium, such as a single optical fiber.

Sudo discloses a combination OFDM (orthogonal frequency-division multiplexing) and CDMA (code division multiple access) radio communication apparatus and method directed to decreasing amplitude differences between subcarrier signals in order to maintain orthogonality between spreading codes. OFDM systems involve electrical (not optical) communication systems and the use of frequency division multiplexing (not wavelength division multiplexing). CDMA systems also involve electrical (not optical) communication.

In contrast, the invention is directed to using spread spectrum encoding to encode information signals, which are then summed in a particular way to produce a modulation signal. An optical transmission signal is then generated based on the modulation signal, e.g., through direct or indirect modulation of a laser.

The Applicants have amended independent claims 1 and 11 to clarify that the Applicants' invention involves wavelength division multiplexing (WDM) methods and apparatuses for use in optical communication systems. Support for the claim amendments can be found in the Applicants' specification, e.g., at paragraphs [0009] and [0028]-[0030]. Also, the Applicants respectfully note that the claimed method and apparatus involve carrying each information signal by all of the transmission channels of the communication system and each of the channels carries part of all the information signals. Sudo does not disclose or suggest such system configuration.

Sudo uses an addition section (2) to add spread transmission signals output from the spreading section (1). Sudo then uses a serial-parallel converter (3) to divide and disassemble the added spread signals into individual chips (bits) for each spread signal, which are then frequency division multiplexed using the IFFT processing section (4). The cited language in col. 1, lines 57-64 recites that subcarriers 1 to k are assigned for bits 1 to k of transmission signals 1 to n. However, the transmission signals 1 to n have been added (by the addition section 2) and divided and disassembled (by the S/P section 3) prior to this assignment. Moreover, the assignment of subcarriers is part of the frequency division multiplexing operation.

The Applicants' claimed invention allocates the same bits of the spreading codes to a respective one of the transmission channels before summing the coded signals. For example, the first bits of two different encoded information signals are inputted to an analog summer of a first transmission channel while the second bits of two different encoded information signals are input to an analog summer of a second transmission channel. The outputs of the analog summers are respective modulation signals that are used to generate respective optical transmission signals. Thus, in the Applicants' claimed invention, in each transmission channel, the summed bits of the encoded information signals correspond to a modulation signal used to generate an optical transmission signal.

In contrast, in Sudo, the divided and disassembled bits of the encoded signals are input to selectors and switching control circuitry used to select subcarrier frequencies for frequency division multiplexing in a way that reduces the difference in amplitude between subcarrier signals. Sudo does not use the divided and

disassembled spread codes as a modulation signal to generate an optical transmission signal.

Accordingly, for at least this reason, the combination of the cited language in Sudo with other references, e.g., Liu et al., does not disclose or suggest the Applicants' claimed invention. Moreover, initially, the language cited in Liu et al. as teaching the Applicants' analog summers 36-39 actually refers generally to the number of bits that can be processed over a given time frame as the summation of the bits for each subchannel, and therefore does not even refer to an adder, but rather a definition for transmission rate. Secondly, the Liu et al. reference is directed to an ASDL (asymmetric digital subscriber line) compatible modem, which is not related to decreasing amplitude differences in OFDM-CDMA systems (Sudo), and therefore likely is not even properly combinable with Sudo. Even assuming, *arguendo*, that these references can be properly combined, nothing in the cited language in Sudo or Liu et al., taken alone or in combination, discloses or suggests the Applicants' claimed invention. Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of claims 1-2 and 11-12 under 35 U.S.C. §103(a) as being unpatentable over Sudo and further in view of Liu et al.

The Examiner rejected claims 3 and 13 under 35 U.S.C. §103(a) as being unpatentable over Sudo and Liu et al., further in view of Shattil (U.S. Patent Publication No. 2002/0150070). The Applicants respectfully traverse the rejection in view of the claim amendments above and the remarks set forth below.

As discussed previously herein, the Applicants' claimed invention recited in independent claims 1 and 11, as amended, is neither disclosed in nor suggested by Sudo alone or in combined with Liu et al. Shattil, which is cited for its disclosure of the use of quasi-orthogonal spreading codes, does not cure the deficiencies of Sudo and Liu et al. with respect to disclosing or suggesting the Applicants' invention. Shattil, like Sudo and Liu, et al., is directed to the electrical domain rather than the optical domain. In particular, Shattil is directed to using spread spectrum encoding in the electrical domain in conjunction with frequency diversity exploitation to improve signal separation. Even assuming, *arguendo*, that these references can be properly combined, the combination does not teach each and every element of independent claims 1 and 11.

Accordingly, the Applicants respectfully submit that Shattil, taken either alone or in combination with Sudo and Liu et al., does not disclose or suggest the Applicants' invention as recited in claims 1 and 11.

The rejected claims 3 and 13 depend directly from independent claims 1 and 11, respectively, and incorporate all of the features of their respective independent claim. Furthermore, claims 3 and 13 include other features that, when combined with the subject matter of their respective independent claim, are neither shown in nor suggested by the art of record. For at least these reasons, the Applicants respectfully submit that claims 3 and 13 are patentable over Sudo in view of Liu et al., and further in view of Shattile, and respectfully request that the rejection be withdrawn.

The Examiner rejected claims 4-5 and 17-18 under 35 U.S.C. §103(a) as being unpatentable over Sudo and Liu et al., further in view of van der Gracht et al. (U.S. Patent No. 4,835,517). The Applicants respectfully traverse the rejection in view of the claim amendments above and the remarks set forth below.

As discussed previously herein, the Applicants' claimed invention recited in independent claims 1 and 11, as amended, is neither disclosed in nor suggested by Sudo alone or in combination with Liu et al. The van der Gracht et al. reference, which is cited for its disclosure of the use of data spreading using exclusive-NORing, does not cure the deficiencies of Sudo and Liu et al. with respect to disclosing or suggesting the Applicants' invention. Accordingly, the Applicants respectfully submit that the van der Gracht et al. reference, taken either alone or in combination with Sudo and Liu et al., does not disclose or suggest the Applicants' invention as recited in claims 1 and 11.

The rejected claims 4-5 and 17-18 depend directly or indirectly from independent claims 1 and 11, respectively, and incorporate all of the features of their respective independent claim. Furthermore, claims 4-5 and 17-18 include other features that, when combined with the subject matter of their respective independent claim, are neither shown in nor suggested by the art of record. Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of claims 4-5 and 17-18 under 35 U.S.C. §103(a) over Sudo in view of Liu et al., and further in view of van der Gracht et al.

The Examiner rejected claims 6 and 19 under 35 U.S.C. §103(a) as being unpatentable over Sudo and Liu et al., further in view of Balachandran et al. (U.S. Patent No. 7,187,715). The Applicants respectfully traverse the rejection in view of the claim amendments above and the remarks set forth below.

As discussed previously herein, the Applicants' claimed invention recited in independent claims 1 and 11, as amended, is neither disclosed in nor suggested by Sudo alone or in combination with Liu et al. The Balachandran et al. reference, which is cited for its disclosure of spreading an information signal by multiplying each bit of the information signal with the corresponding bit of a spreading code, does not cure the deficiencies of Sudo and Liu et al. with respect to disclosing or suggesting the Applicants' invention. Accordingly, the Applicants respectfully submit that the Balachandran et al. reference, either alone or in combination with Sudo and Liu et al., does not disclose or suggest the Applicants' invention as recited in claims 1 and 11.

The rejected claims 6 and 19 depend directly from independent claims 1 and 11, respectively, and incorporate all of the features of their respective independent claim. Furthermore, claims 6 and 19 include other features that, when combined with the subject matter of their respective independent claim, are neither shown in nor suggested by the art of record. Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of claims 6 and 19 under 35 U.S.C. §103(a) over Sudo in view of Liu et al., and further in view of Balachandran et al.

The Examiner rejected claims 14-16 under 35 U.S.C. §103(a) as being unpatentable over Sudo and Liu et al., further in view of Way (U.S. Patent Publication No. 2002/0021464). The Applicants respectfully traverse the rejection in view of the claim amendments above and the remarks set forth below.

As discussed previously herein, the Applicants' claimed invention recited in independent claims 1 and 11, as amended, is neither disclosed in nor suggested by Sudo alone or combined with Liu et al. The Way reference, which is cited for its disclosure of an optical transmitter, does not cure the deficiencies of Sudo and Liu et al. with respect to disclosing or suggesting the Applicants' invention. Accordingly, the Applicants respectfully submit that the Way reference, either alone or in combination

with Sudo and Liu et al., does not disclose or suggest the Applicants' invention as recited in claims 1 and 11.

The rejected claims 14-16 depend directly or indirectly from independent claim 11, and incorporate all of the features of claim 11. Furthermore, claims 14-16 include other features that, when combined with the subject matter of claim 11, are neither shown in nor suggested by the art of record. Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of claims 14-16 under 35 U.S.C. §103(a) over Sudo in view of Liu et al., and further in view of Way.

CONCLUSION

In view of the foregoing, the Applicants respectfully submit that all rejections have been overcome and/or traversed and that the application now is in full condition for allowance. Accordingly, the Applicants earnestly solicit early and favorable action. Should there be any further questions or reservations, the Examiner is urged to telephone the Applicants' undersigned attorney at (770) 709-0012.

Respectfully submitted,
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